Seat No: _____ Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018 - 19 Examination

Semester: 5 **Date: 17/05/2019**
Subject Code: 03109302 **Time: 10:30 AM to 1:00 PM**
Subject Name: Fluid Power Engineering **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Each of one mark) **(15)**

1. Which fluid is used in hydraulic power System?
(a) Water (b) Oil (c) Non-compressible fluid (d) All of the above

2. Which of the following is not a Reaction turbine?
(a) Pelton turbine (b) Francis turbine (c) Kaplan turbine (d) Propeller turbine

3. If the blades of the axial flow turbine are fixed, these are called
(a) Kaplan turbine (b) Propeller turbine (c) Francis turbine (d) Pelton turbine

4. A Kaplan turbine is used when the available head of water is
(a) 8.5 to 30 m (b) 30 to 51 m (c) 51 to 225 m (d) 255 to 860 m

5. Why is fluid power preferred in mobile vehicle?
1. power can be transmitted without any delay
2. when overloaded, fluid power systems stop without damaging the components
3. speed variation cannot be achieved
4. fluid is non-compressible
(a) 1 and 4 (b) 2,3 and 4 (c) 1,2 and 4 (d) 1 and 2

6. Pipes of largest diameter which carry water from reservoir to turbine is known as _____.

7. _____is defined as ratio between power delivered to runner and power supplied at inlet of turbine.

8. Cavitation usually occurs due to the changes in _____.

9. Discharge capacity of the reciprocating pump is _____ that of the centrifugal pump.

10. The number of bucket of Pelton wheel is 25 and diameter of runner is 1.5 meters then calculate diameter of jet is _____.

11. In which of the turbine inlet whirl velocity and inlet jet velocity are equal in magnitude?

12. A jet of water of diameter 50 mm moving with a velocity of 20 m/s strike a fixed plate in such a way that the angle between the jet and the plate is 60˚. Find the work done by the jet on the plate per second.

13. The process of filing the liquid into the suction pipe and pump casing upto the level of delivery valve is called as ?

14. Degree of reaction turbine is the ratio of ?

15. Which device is used for transmitting increased or decreased torque from one shaft to another shat without any mechanical contact?

Q.2 Answer the following questions. (Attempt any three) **(15)**

A) Sketch a hydro-power plant and explain its different elements.

B) A Kaplan turbine runner is to be designed to develop 9100 kW. The net available head is 5.6 m. If the speed ratio = 2.09, flow ratio = 0.68, overall efficiency = 86% and the diameter of the boss is 1/3 the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine.

C) Define specific speed of a pump. Derive an expression for the same.

D) What are the uses of a draft tube? Describe with neat sketches different types of draft-tubes.

Q.3 A) A jet of water having a velocity of 15 m/s strikes a curved vane which is moving with a velocity of 5 m/s. The vane is symmetrical and is so shaped that the jet is deflected through 120°. Find the angle of jet at inlet of the vane so that there is no shock. What is the absolute velocity of the jet at outlet in magnitude and direction and the work done per unit weight of water. Assume the vane to be smooth. **(07)**

(B) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m. works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm. Determine : (i) vane angle at inlet, (ii) Work done by impeller on water per second (iii) Manometric efficiency. **(08)**

OR

(B) A single acting reciprocating pump running at 50 rpm delivers 900 liters of water per minute. The diameter of the piston is 250 mm and crank radius is 200 mm. The centre of the pump is 4 m above the water surface in the sump and water is delivered by the pump to a tank which is 25 m above the centre of the pump. Determine: **(08)**

(i) The theoretical discharge of the pump
(ii) Co-efficient of discharge
(iii) Weight of water delivered per second
(iv) Power required to drive the pump
(v) slip and percentage slip of the pump.

What will be the change if the single acting reciprocating pump is replaced by double acting reciprocating pump?

Q.4 (A) With usual notations derive an expression for work of reciprocating air compressor by considering clearance. **(07)**

OR

(A) Describe briefly the function of various components of Pelton turbine with neat sketch. **(07)**

(B) Draw a neat sketch and explain the principle and working of **(08)**
(i) Hydraulic coupling (ii) Hydraulic Ram.